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ABSTRACT

Freshman botany students, graduate students, and student library assistants participated in a study to determine the effectiveness of a self-paced workbook on learning library skills in searching science literature and to determine staff and funding requirements to run larger scale instructional programs. The botany students comprised four groups. The volunteer group used the entire workbook, whereas the randomly selected groups completed portions of the workbook assignments and received additional instruction at three levels: none, library tour only, or workbook available on request. Graduate students and student library assistants were required to complete the entire workbook. Participants were given a pretest and posttest consisting of selected questions from the workbook. The results of the study indicated that students completing the workbook had statistically greater score increases on a standard test than those student groups who did not have access to the workbook. Activities involved, the amount of time to prepare the workshop material, and the cost of printing the workbook and pretests are discussed. Also discussed are the workbook, materials, time tables for assignment completion, costs, and staff. Suggested program implementation is outlined. Five tables, two figures, and three references are provided. (RBF)

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FINAL REPORT: PILOT STUDY -LIBRARY INSTRUCTION WORKBOOK FOR THE SCIENCES FOR USE IN MITCHELL MEMORIAL LIBRARY, MISSISSIPPI STATE UNIVERSITY

BY

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I. INTRODUCTION

Lawrence Clark Powell, founder of the University of California Graduate School of Library Science wrote:

> "People turn to books for all that books hold for people: knowledge and power, distraction, delight, strength and solace. Some need no more help, no intermediaries. More, however, do need help, do need librarians as guides."(1)

This statement summarizes the goal of library instruction - to guide people to the materials and information they seek.

Lack of guided instruction at Mississippi State University in use of science resources of Mitchell Memorial Library prompted the authors to seek a method of effectively teaching basic skills for searching science literature. Development of materials for a self-paced workbook for this purpose was begun during the summer of 1980 in anticipation of contact during the Fall Term 1980 with 3 groups of students whom the authors felt would benefit from such instruction. The first of these groups, a freshman botany class, represented students with little previous experience in a university library. The second group consisted of student assistants working in the Physical and Biological Sciences Reading Room (PB), Mitchell Memorial Library, who required training to effectively answer requests for information by patrons of PB. Students at the graduate level also participated on a limited basis.

II. PILOT STUDY APPROACH

A pilot study was conceived as a means to obtain information about how library instruction in searching of science literature could be provided within the bounds of anticipated budget and staff limitations. A pilot study would provide background information for a larger scale library instruction program in the biological sciences and would establish whether library instruction could actually improve ability of students to utilize library

resources.

Purpose of the pilot study was: (1) to provide instruction in basic library skills essential to students for coursework and writing papers; and to student library assistants in order to aid patrons in PB, (2) to encourage more sophisticated and informed use of library resources, (3) to encourage more use of library resources in general, and (4) to provide this instruction at minimal cost to the library and with minimal time for correction of workbooks.

Goals of the study were: (1) to demonstrate the effectiveness of the self-paced approach to library instruction, and (2) to support the inclusion of such instruction in basic science courses at MSU.

Objectives in meeting these goals were: (1) develop instructional materials to teach library skills in searching scientific literature, and (2) measure the increase in library skills attained by use of the materials.

The study received administrative support from the Library and the Department of Biological Sciences. The Office of Graduate Studies and Research provided editorial assistance. Development of materials and correction of assignments, pre-tests and post-tests were done outside normal work hours. The Department of Biological Sciences provided funding to print 100 copies of the workbook which was printed by Central Duplicating Services, MSU.

III. ELEMENTS OF THE PILOT STUDY

A. Writing and Developing Materials

Permission was obtained to reproduce and adapt portions of Self-Paced Instructional Workbook for the Sciences[2] by Isabel Dickinson (2) for use with the biology students at MSU. The explanatory text was written first for each chapter, then 5 variations were developed for each question in the corresponding chapter assignments to avoid student collaboration.

The workbook consists of an introduction, 17 descriptive chapters followed by corresponding assignment sheets, and a conclusion. The introduction includes the goals of the workbook, when the assignments are due and the completion requirements. The book is divided into three sections: (1) Locating Libraries and Materials, (2) Special Tools (Dictionaries, Handbooks, Encyclopedias and Biographical Tools) and (3) Indexes and Abstracts to Journal Literature.

The assignments are straightforward. The goals are (1) to get the students into the library, (2) to teach them the location of specific tools by answering questions using those tools, and (3) to encourage contact with the science reference librarians. Some programs such as the one at the University of California provide a unique set of questions for each student. In our pilot study, 5 separate sets of questions were developed since the number of students participating was less than 100 in 2 different classes. The different question sets were essential to keep students from copying from one another.

A pre-test, based on the questions in the workbook, was developed and administered before participants began the workbook assignments. The same test was administered again following completion of the workbook assignments.

Table 1 shows activities required to prepare the materials for the pilot study and approximate time spent in completing each activity.

B. Costs

Our budget included only the cost of printing the workbook and pre-tests. Actual printing costs incurred are shown in Table 2. Staff salaries, some miscellaneous supplies, and other expenses were not included since they were donated by the authors, Mitchell Memorial Library, and the Department of Biological Sciences.

Table 1. Time requirements for activities in pilot study.

Activity	Time
Writing and editing	150 hours
Revisions	20 hours
Typing	60 hours
Trial runs of the 5 workbooks	20 hours
Editing and preparation of final masters for printing	40 hours
Printing	2 weeks
Collation by hand of 100 copies of the workbook	20 hours
Correction of the assignments	30 hours
Data compilation	20 hours
Report preparation	20 hours

C. Experimental Design

The pilot study was done with participants from 3 sources: (1) students at the undergraduate level, (2) students from two graduate classes, and (3) student assistants in PB. Experimental groups and treatments of the students participating in the pilot study are shown in Table 3.

Four groups of undergraduate students were included. One group was chosen non-randomly; they volunteered to use the entire workbook. The remaining 3 groups were chosen randomly from the remainder of the botany class. Randomly selected students completed portions of the workbook assignments and received additional instruction at 3 levels (Table 3): none, library tour only, workbook available on request. Graduate students and PB library assistants were required to complete the entire workbook.

All participants were given a pre-test and a post-test consisting of selected questions from the workbook. At the end of the study the effectiveness of the workbook was quantified by statistical analysis of the pre-test and post-test scores.

D. Timetable for Completion of Assignments

All participants turned the workbook assignments into PB for correction. Students kept the descriptive chapters for future reference. Perforated assignment pages allowed easy removal of the pages from the workbook. Pages could be handed in separately or stapled together and handed in as a group for correction.

PB student assistants completed the assignments over six weeks during non-peak patron hours after priority work activities were completed in the reading room. This schedule provided time for 2 or 3 assignments each week. Graduate students completed the assignments in 2 weeks. The volunteer group turned in completed assignments following a schedule over six weeks. This completion schedule spread out assignments to minimize effects large

Table 2. Printing costs for workbooks in pilot study, August 1980.

Item	Supplies +	Duplicating =	Total	Running Total
100 Covers (printed front)	8.80	2.15		
Plates	6.00			
Marking		2.80		
Negatives	4.30			
Folding		2.60		
Scoring		7.30		
Punching		.80		
	19.10	15.65	34.65	34.75
Title page (fb)				
100 copies		6.00		
Mats	.30			
Punching		.80		
	.30	6.80	7.10	41.85
Text				
100 copies, 34 pages (white)		102.00		
Mats	5.10			
Punching		2.72		
			109.82	151.67

Table 2. (Continued)

Item	Supplies +	Duplicating =	Total	Running Total
Assignment pages (cost per set x 5)				
20 copies, 18 pages (green)		12.60		
Mats	2.70			
Punching		.80		
	2.70	13.40	80.50	232.17
Assignment one (same in each book)				
100 copies, 1 page (green)		3.50		
Mats	.15			
Punching		.80		
	.15	4.30	4.45	236.47
Perforation of assignment sheets and blanket		54.32	54.32	290.79
Fasteners: Acco 8½"				
25 @ .29 less 10% (Sullivans)		6.53		
78 @ .21 (MSU Bookstore)		16.53		
		23.06	23.06	313.85
Pre-test				
100 copies, 5 pages		15.00		
Mats	.75			
	.75	15.00	15.75	329.75

Table 3. Experimental groups and treatments of students participating in pilot study of library instruction in the biological sciences.

Source of Participants	Selection and Participation Type	Workbook Assignments	Additional Treatment
Undergraduates	Volunteer[1]	Entire Workbook	Workbook provided
" "	Randomly chosen[2]	Selected Portions	None[3]
	Randomly chosen[2]	" "	Tour[4]
	Randomly chosen[2]	" "	Workbook available[5]
Graduates[6]	Required	Entire Workbook	Workbook provided
PB assistants[7]	Required	Entire Workbook	Workbook provided

[1] Volunteers were provided the entire workbook.

[2] Randomly chosen undergraduate participants were drawn from the pool of students which had not volunteered for use of entire workbook.

[3] Only normally available library reference services were available.

[4] Given the pamphlet, "A Walking Tour," Mitchell Memorial Library, 1978.

[5] Students were told that the workbook was available on request from the reference librarian.

[6] Given the workbook to complete as part of their coursework requirement.

[7] Given the workbook to complete on work time and as a part of their job training.

numbers of students might have on staff and resources of the PB reading room.

E. Correction of Assignments

Two methods were developed for correcting the assignments. Single master sheets were prepared for each chapter assignment listing the 5 question variations and 5 corresponding answers. Separate master books for each of 5 assignment variations were compiled with the correct answer circled on the sheets for each question.

F. Editing and Revisions

An editing copy of the workbook was set up in a loose-leaf notebook. Changes and additions made in this copy constituted the final draft for descriptive chapters and the 5 assignment variations. Revisions and further updating will be done in the editing copy in order to ensure coordination and inclusion of materials originating from several independent sources.

IV. RESULTS OF PILOT STUDY

Results of the pilot study are shown in Figures 1 and 2 and in Tables 4 and 5. In every case, the mean post-test score was higher than the mean pre-test score. This implies that any experience in the library is beneficial.

The effect of the library skills workbook can best be seen in scores of the 2 groups for which completion of the workbook was required - 2 graduate classes and the PB student assistants. These results are shown in Figure 1 and Table 4. In both cases, there is a statistically significant gain in mean score on the standard test after completion of the workbook (see Table 4).

The beneficial effect of the workbook is also evident in the mean test scores of the general botany class, when these scores were subjected to analysis of variance. These results are shown in Figure 2 and Table 5. There was a significant difference (i.e. an increase) between the pre-test

and post-test scores. It is also interesting that there was no statistically significant difference between the performance of volunteers who used the workbook and a randomly chosen group (group II: "workbook available" in Figure 2) whose motivation for using the workbook was strictly goal-oriented; they believed it would help them complete the library assignment. We believe, therefore, that the significant score gain on the part of volunteers is a result of using the workbook, and is not due to the better performance, in general, of students who volunteer to do what the teacher asks. Two-way analysis of variance (Table 2) of mean score gains for volunteers and randomly chosen groups indicates that there is a statistically significant difference in mean score gains among the treatment groups (i.e.: some groups gained more than others). Furthermore, the mean score increases of volunteers and the group to whom the workbook was available, are not statistically different; but both have significantly higher score increases than either group to which the workbook was not available.

V. DISCUSSION

A. Effectiveness of Workbook

Results of the pilot study have shown that there is a significant beneficial effect from use of the workbook for library instruction as measured by increases in scores on a standard test. Every group of students who either were required or volunteered to complete the workbook or by whom the workbook was freely chosen in order to complete the library assignment, had a statistically greater score increase on the standard test than did those groups of students to whom the workbook was not available. We conclude that Science Resources: A Self-Paced Instructional Workbook[3] as used in this study greatly improved the students' ability to use library resources.

Table 4. T-test for significance of difference of means between pre-test and post-test scores for graduates and student assistants.

Group	N	t	d.f.	Critical value of t at 0.05	Significant at 0.05
Graduates	16	6.54	15	2.13	yes
Student Assistants	17	5.65	16	2.12	yes

Table 5. Analysis of variance of score gains and treatment groups for general botany students administered a standard test during library instruction pilot study.

Source of Variation	d.f.	F	Significant at 0.05
Among groups	3	8.283	yes
Between tests	1	28.727	yes

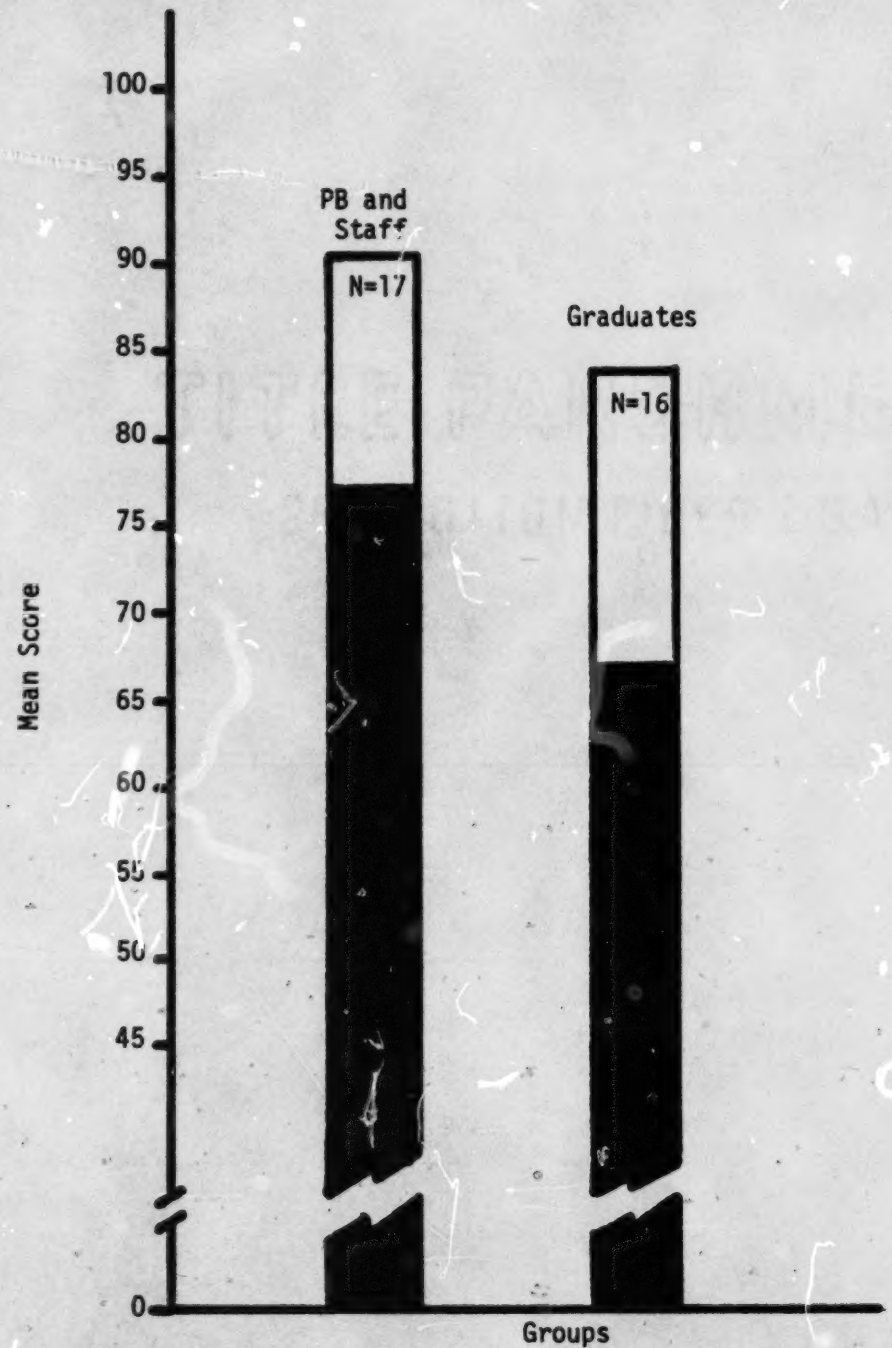

Figure 1. Comparison of mean pre-test and post-test score for graduate students and PB student assistants

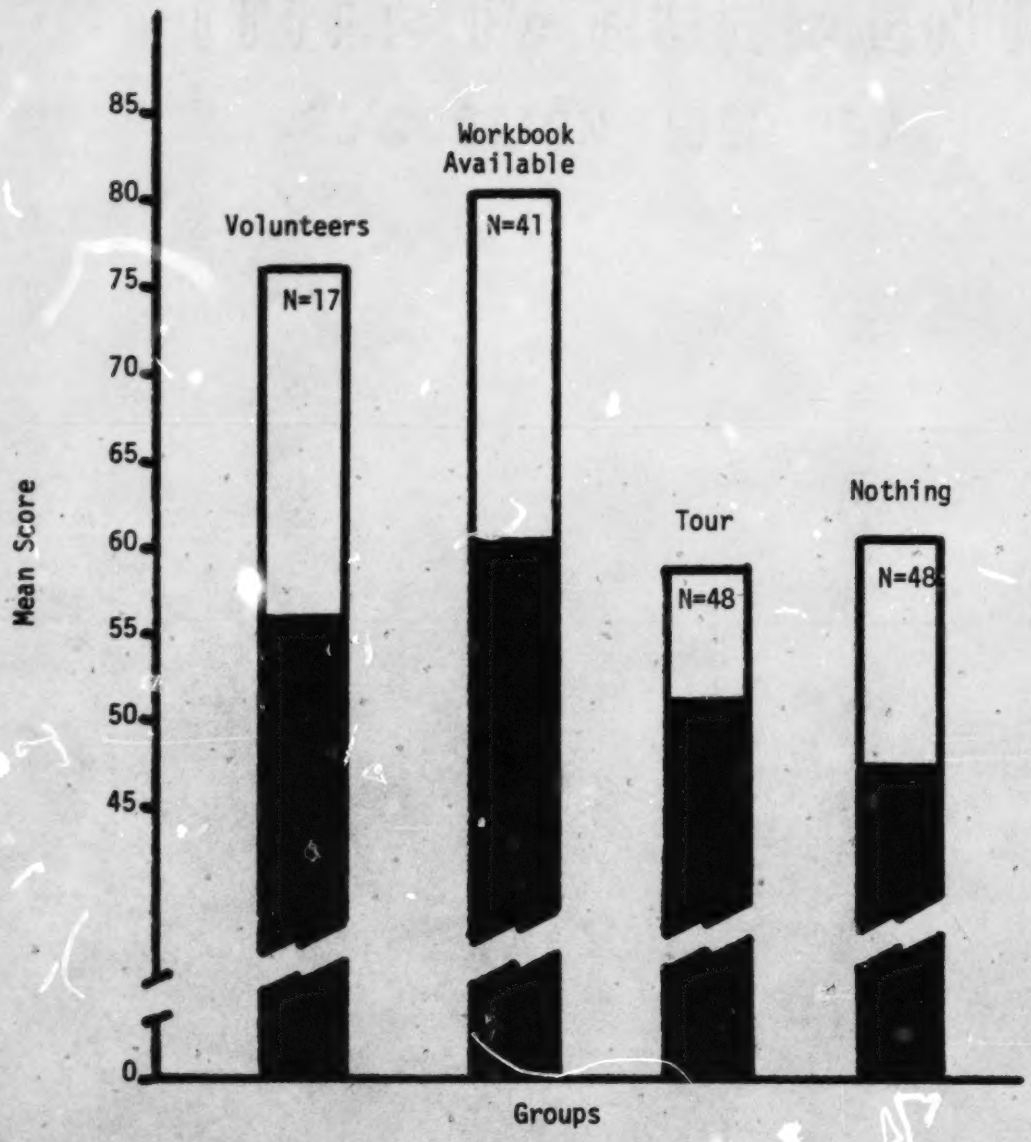

Figure 2. Comparison of mean pre-test and post-test scores of general botany students from 4 treatment groups of pilot study

B. Materials

Reactions and comments of participating students indicated that the content of the workbook was appropriate for new students at several levels in the sciences at MSU: (1) undergraduates, (2) graduate students, (3) transfer students, and (4) new library student assistants in PB since the materials cover basic tools required for general research activities. Additional flexibility and specialization of materials is also possible since content of the workbook can be modified for specific course requirements or specific fields of study. This would require cooperation with faculty members for identification of the specific needs for a given course or field of study and determination of which reference tools have the most value. Chapters and assignments could be developed for any of the numerous indexes and tools available such as Chemical Abstracts, Zoological Record or Entomological Abstracts not included in the original workbook. Sections could be also developed to inform students about use of the computerized literature search as a research tool.

Use of a word processor to record materials on tape would lessen the typing and editing time required in preparing future editions or variations of the workbook. Changes or additions are easily made once the materials are recorded on tape. Printed copies of the materials could then be used to produce masters for offset printing of the workbooks. Cover design and lettering, illustrations, and maps must be prepared manually and transferred to masters for printing.

Regular re-evaluation of the materials is suggested to determine whether the students continue to improve by their use. Use of machine-readable answer forms would shorten correction time for pre- and post-tests. Correction and analysis of scores could be done by the computer.

C. Timetables for Completion of Assignments

Since most students finished the entire workbook in 6 to 8 hours, a six-week completion period was too long. Both undergraduates and graduates could probably complete the entire workbook in 2 to 3 weeks. For training of student assistants in PB, use of the workbook is possible as part of initial training or as part of a continuing training program over several weeks.

Perforated assignment pages permitted students to: (1) turn in single assignments as they were due or (2) remove all assignment pages and staple them together for correction. The first option is advantageous in the training situation in PB where only a few assignments are completed each week. The second option is desirable for classes since assignments are kept together for correction and return of materials to students is facilitated. Also, those students who need to repeat incorrectly answered questions are readily identifiable from assignment sheets returned as a complete set when this is required for a particular class.

D. Costs and Staff

The pilot study did not require additional staffing since this was volunteered from three sources. Students participating in the study were able to complete most of the assignments with little staff assistance. The major impact on the Physical and Biological Sciences Reading Room (PB) occurred in the form of staff time for support activities related to preparation of the workbook. Additional staff assigned specifically to a library instruction program based on such a workbook would be essential to avoid interruption of established routines in PB if a workbook program larger than the present pilot study were undertaken.

An expanded program would require staff to assist with clerical activities: typing, support in development of new chapters and assignment

variations, collation of workbooks, correction of assignments and related recordkeeping. Support staff would reduce the librarian's time directly involved with such activities, although time would still be required as part of a normal work schedule for coordination and supervision of staff.

VI. CONCLUSION

Any expansion of science-related library instruction should include a workbook as an integral part of the course. The students would be required to complete the workbook correctly to receive a grade in the course. Incorrect answers would be repeated.

To implement such a program a two-phase plan is suggested:

PHASE I -

Allocation of Staff

1. Librarian: Authorization to devote predetermined % of official time coordinating the program and developing materials
2. Provide support staff for typing, devising and proofing question variations, collation of materials, and correction of assignments
3. Operator for word processor to input materials and make revisions for final draft

Materials

1. Development of additional question variations to avoid student collaboration based on the number of students to complete the workbook
2. Trial runs of new question variations
3. Input of materials into a word processor
4. Revision of existing materials
5. Preparation of final masters for printing
6. Development of new chapters not included in the original workbook

7. Modification of questions to multiple choice format
8. Development of a method to correct pre-test and post-test questions by computer

Workbook Production

1. Print workbooks
2. Collate workbooks
3. Print the pre-tests and the post-tests
4. Collate the pre-tests and the post-tests

PHASE II - Implementation of Program

Allocation of Staff

1. Librarian: Authorization to devote predetermined % of official time coordinating the program and supervising support staff
2. Provide support staff for assignment correction, recordkeeping, revision of materials, typing
3. Operator for word processor to update materials following completion of each testing cycle

Program Design

1. Students purchase workbooks
2. Administration of pre-tests to students
3. Students complete the workbook assignments following a predetermined schedule. Each group would have different starting and completion dates allowing 2 weeks for each group to complete the workbook.
4. Correction of assignments. Identification of students who need to repeat assignments.
5. Administration of post-tests
6. Correction of pre-tests and post-tests

Evaluation and Planning

1. Comparison of pre-test and post-test scores to determine effectiveness of materials
2. Determination of changes and revisions in materials
3. Analysis of program dynamics related to the demands on staff in PB and resources in the library used in the assignments
4. Determination of costs to continue the program, including: library materials, supplies, staffing and production of workbook expenses.

Additional means to staff and fund an expanded program are essential, whether provided cooperatively between the Library and Department of Biological Sciences, through University funding, or by cost-recovery through an eventual self-supporting program involving sale of the workbooks.

VII. LITERATURE CITED

(1) Powell, L.C. "On the Grindstone" in The Little Package. Cleveland: World Publishing Company, 1964.

(2) Dickinson, Isabel. Self-Paced Library Instruction Workbook for the Sciences. Bio-Agricultural Library: Library of the University of California, Riverside, 1979.

(3) Ellsbury, S.H., D. Wise, and M.M. Ellsbury. Science Resources: A Self-Paced Instructional Workbook. Mississippi State: Mississippi State University, 1980.